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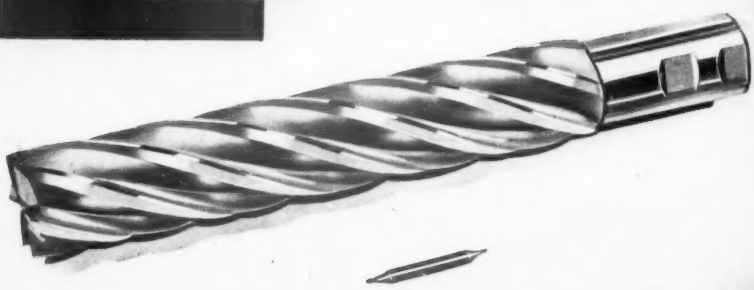

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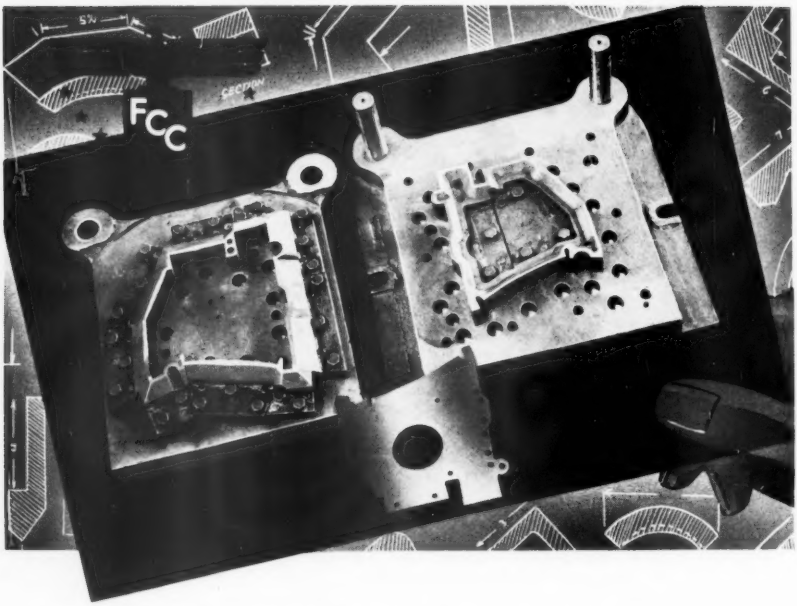

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The TOOL & DIE Journal
Tool-Die-Machine PROGRESS

Editor George J. Huebner
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Circulated monthly to executives and department heads responsible for designing, building and using Precision Tooling.

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Official Organ of the Special Tool, Die and Machine Shop Institute

Vol. 7 JUNE, 1941 No. 3

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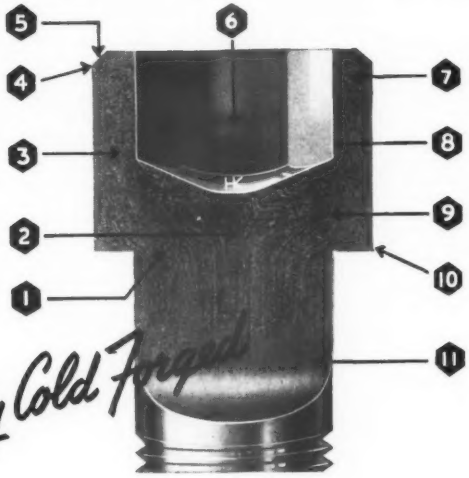

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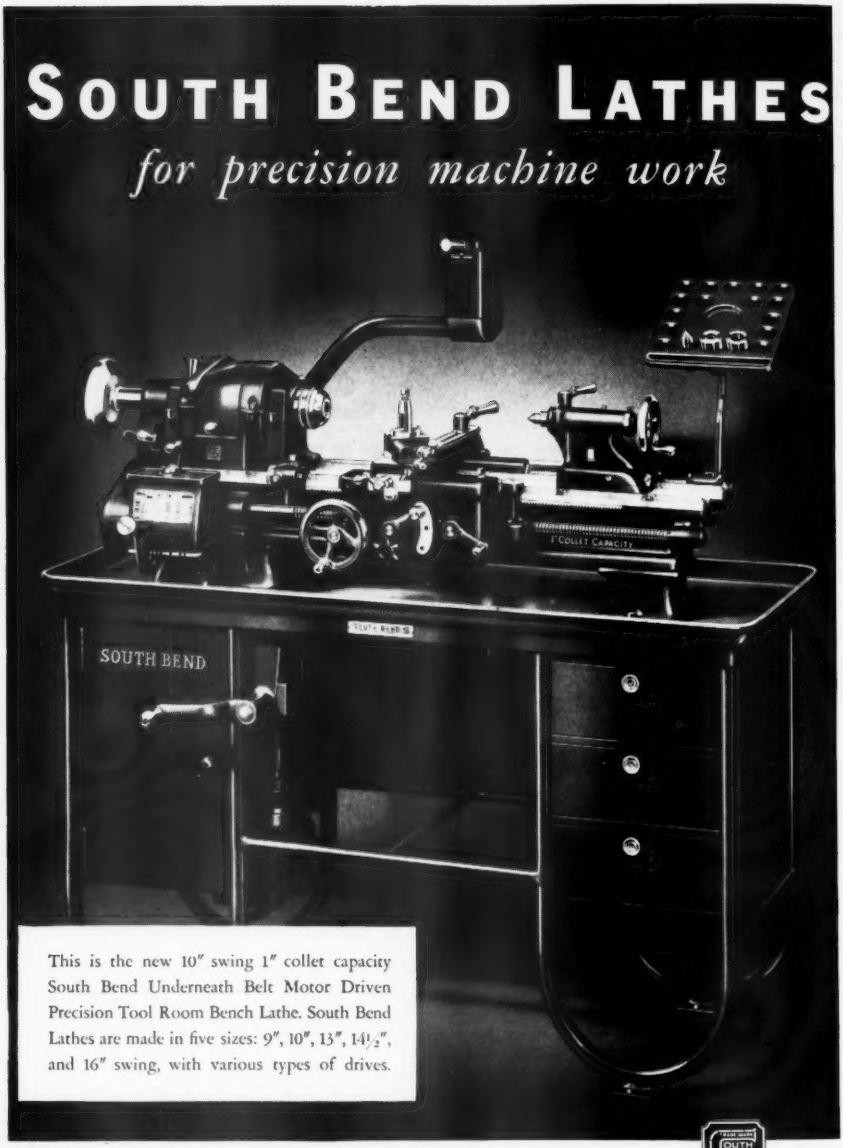

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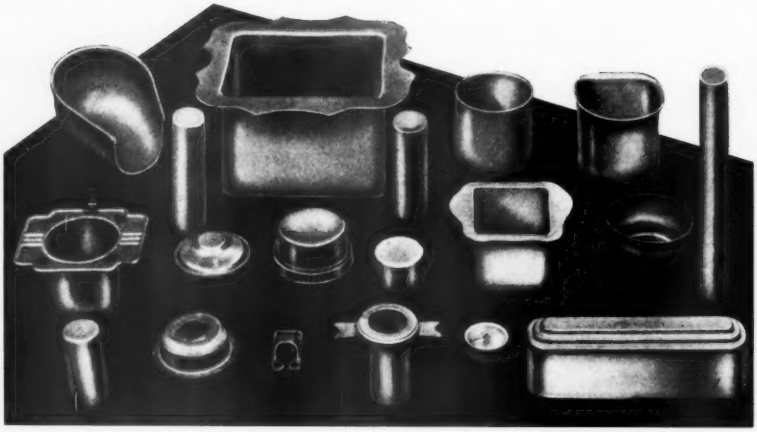

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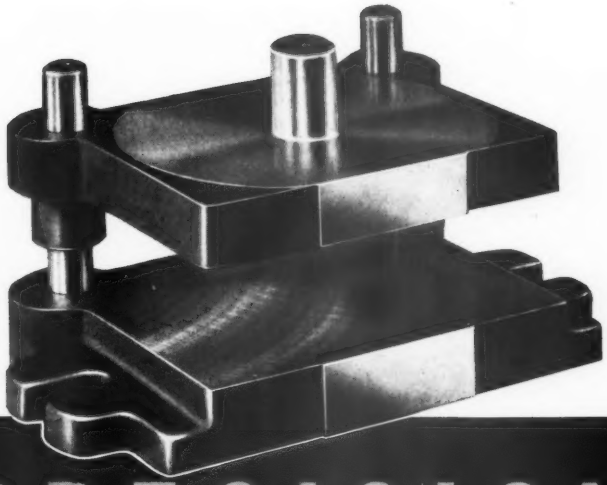

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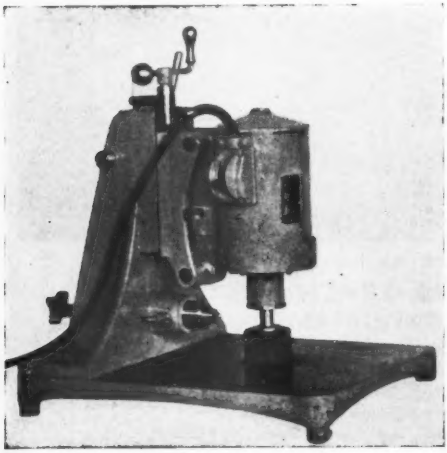

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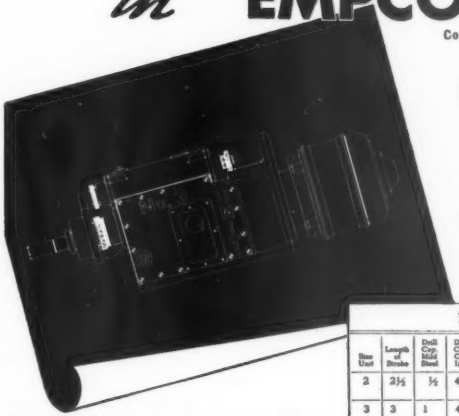

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2	2½	½	4-⅝	4-⅝	½ to 1	Max. 3500 Min. 110	Max. 2300 Min. 80	Max. 900 Min. 30
3	3	1	4-⅝	4-⅝	1 to 3	Max. 3500 Min. 110	Max. 2300 Min. 80	Max. 900 Min. 30
4	5	1	4-⅝	4-⅝	1 to 3	Max. 3500 Min. 110	Max. 2300 Min. 80	Max. 900 Min. 30
5	5½	1½	10-⅞	6-⅞	5 to 7½	Max. 2625 Min. 110	Max. 1725 Min. 80	Max. 900 Min. 30
6	6	3	20-⅞	12-⅞	5 to 10	Max. 2625 Min. 110	Max. 1725 Min. 80	Max. 900 Min. 80

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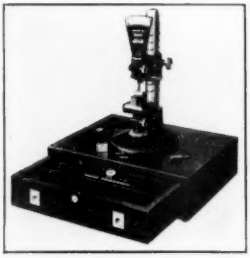

Fig. 1

Fig. 2

The Scherr **INSPECTION UNIT (Fig. 1)** consisting of Comparitol to inspect to 1/10000" and **INSPECTO-SET**, 34 gauge blocks producing thousands of combinations in steps of 1/10000", is available to your shop at a reasonable price.

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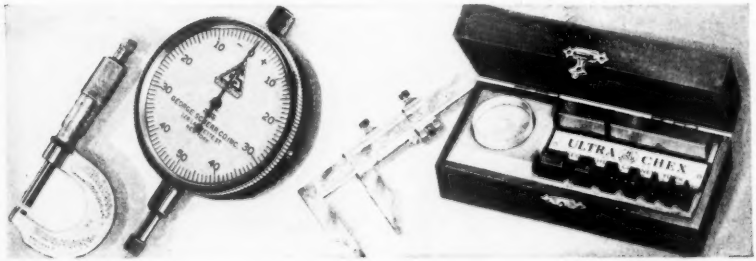

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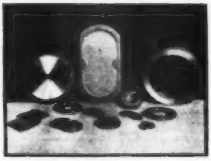

"Fine finish, accurate flat surfaces"... "High production even on small lots"... "Operation is easy, quickly learned" — these are the reasons for the esteem with which Blanchard Surface Grinders are held throughout the manufacturing industry. The Blanchard No. 18, at left, is typical of hundreds of installations where the full scope of Blanchard versatility is used. The parts shown include castings that are finished from the rough — rings with parallel faces — a circular knife ground concave (by means of the Blanchard concave grinding device). The No. 18 Blanchard is shown facing large rings at the rate of 96 per hour (former method produced 20 per hour). Perhaps Blanchard can offer you golden opportunities that you never realized. Just write —

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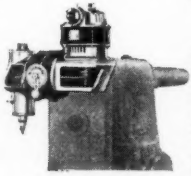

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The TOOL and DIE Journal

TOOL—DIE—MACHINE PROGRESS

JUNE, 1941 Vol. 7, No. 3

The Design of a Universal or Adjustable Block and Pad Forming Die

By H. G. SPAULDING

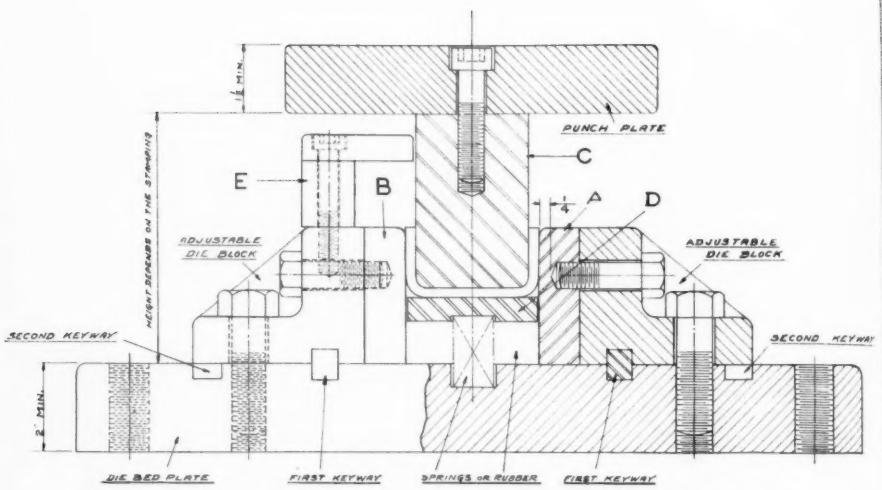
Die Engineer

A MANUFACTURER of truck bodies had the problem of making a number of body channel posts for a new model. The production requirements called for initial runs of 1000 to 5000 pieces. The cost of building separate dies for each type of post would have been prohibitive. Analysis of the designs indicated that a group of eight types of posts had widths within fairly close limits and shapes that varied only slightly. Obviously, if a single die could be designated to form the eight sizes and shapes of posts the cost of forming each size and shape could be kept within a reasonable figure. In fact, the die—a universal or adjustable block and pad forming die—was designed to meet the low estimated forming cost set up in the production budget.

The block and pad forming die is a type designed to use inserts. As long as the widths and shapes of the pieces to be formed were fairly uniform, the shut height of the die was determined by the maximum flange required. The lengths of the longest and shortest pieces determined the length of the die bed and punch plates. In this case lengths ran from 2 to 5 feet. Die parts were designed to handle material to $\frac{3}{16}$" hard, tough steel.

The drawing illustrates a cross section view of a block and pad forming die that can be adjusted to suit a variety of shapes and forms of channels. It can be used for sections that have a radius or irregular curve on one leg of channel or an offset that might require two or more operations to form. All operations can be handled with this one die by changing forming inserts "A" and "B" and punch "C". Pressure pad "D", and combination gage and stripper "E", also will have to be changed to suit each piece.

This die is very economical for low production when there are a large number of stampings to be made that do not vary too greatly in size. The die bed plate and punch plate can be made of tank (or terne) plate, the size depending on the largest stamping to be made. The largest stamping locates the second keyway in the die bed plate; the first keyway is located by the smallest stamping to be made. Both plates are ma-



A cross section view of a block and pad forming die showing one set of inserts "A" and "B", punch "C", pressure pad "D" and combination gage and stripper "E" in position.

chined and ground so that they are perfectly parallel.

The adjustable die blocks are castings made of die iron and machined to assemble to accurate right angles with the bed and punch plates. Keyways must be held to the same accuracy.

Inserts are of Tool Steel

Inserts "A" and "B" are of tool steel, the grade of which depends on the number of stampings required and the type of steel from which the stampings are to be made. Care should be taken that these inserts are machined accurately and that they have the exact shape of the piece when they are inserted in the die blocks.

Punch "C" can be made from a block of die iron or a casting—the size and shape of the stamping in each case determining which would be the more economical. The punch is machined to fit within specified tolerances. Allowance for the thickness of the material to be stamped is made between the inserts and the punch. When drilling and tapping holes to fasten the punch to the punch plate, be sure that the die is in accurate alignment.

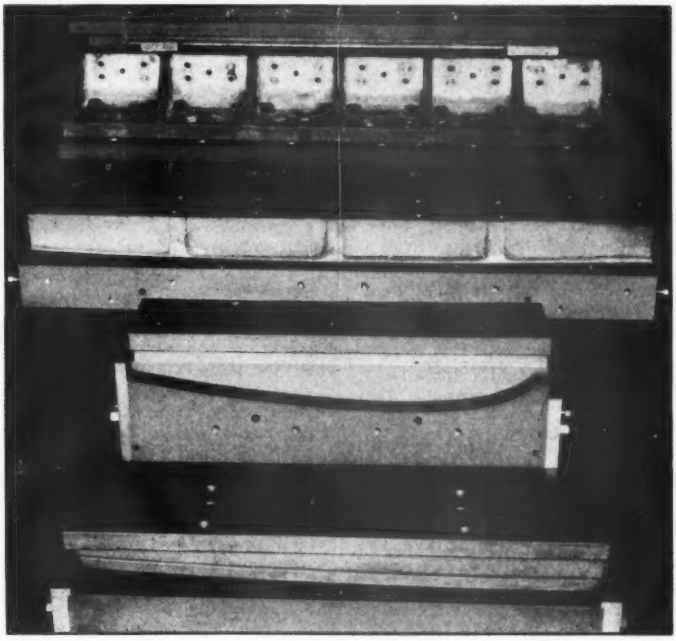
Combination gage and positive stripper "E" should be made from tool steel, the grade depending on the number of stampings to be made. One of these combinations should be located at each end of the piece on one side. Care should be taken when locating that it gages the piece accurately and does not bind the punch or mark the stamping.

Pressure plate "D" is made from cold rolled steel, its size and shape depending on the stamping in each operation. This plate is never less than one-half inch thick. The pressure plate must come to one-quarter inch above the top of the inserts so that there is enough pressure to grip the piece firmly between the plate and the punch so that it does not slip at the beginning of the forming operation. This can be accomplished by using spring pressure or sponge rubber. When using springs, they should either be inserted in the die bed plate or be centered by locating studs to prevent breakage. The springs must have sufficient movement so that they are not overloaded when the die is shut. This can be assured by choosing springs whose solid height is slightly less than the total compression when the die is shut. A

plate across the ends of the inserts "A" and "B" acts as a guide for the pressure plate and keeps it in alignment.

In some cases it will be necessary to bottom the pressure plate when die is shut to form an offset impression on the curve in the bottom of the stamping. This can be done by welding pieces of cold rolled steel to the bottom of the pressure plate, making certain that they do not interfere with springs or rubber —whichever is being used.

The photograph shows a side view of the block and pad forming die and three of the eight inserts. The insert immediately below the die (No. 1) is of cast die iron. Note that it is designed to bow the channel at both ends. The initial run of this part was 2000 pieces. The shorter insert (No. 2) is of tool steel because the channel shaped bottom is harder to form and the initial run was longer (4000 pieces). The insert below (No. 3) is of cast die iron. It forms a flat channel for a small front corner post. This piece, after being formed, is split down the center by a circular or band saw to form right and left hand pieces. The initial run of this piece was also 4000.



Top — side view of block and pad forming die.
No. 1 Insert — for bowing a channel at both ends.
No. 2 Insert — for forming the bottom of a channel.
No. 3 Insert — for a flat channel which forms a corner post.

A total of eight inserts were made for this die. Runs from 1000 to 5000 pieces were made with each initially, with additional runs to meet production requirements. After a model change, more inserts were made which were also used in the same die.

The adjustable block and pad forming die should always be considered where a number of parts or pieces are close enough in size and shape to permit their forming by the use of inserts. The lengths of runs and the tolerances to be held, the necessity of holding to a fixed die cost and the available presses, including press down time, are factors which present problems that often can be met efficiently and economically with such an adjustable block and pad forming die.

Carbide tools reduced tool costs 50 percent in machining .40 to .50 percent carbon steel gear blanks. Finished blanks are $7\frac{7}{16}$" in diameter, have a 1" face and are heat treated to 225 Brinell. The operator is checking the diameter with his micrometer caliper.

Design and Power Steel Cutting

By Philip M. McKenna and

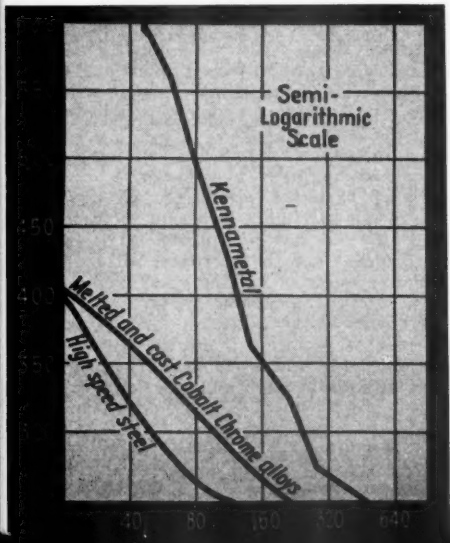
THE rapid spread of the use of the carbide tool for economical machining of steel has been greatly stimulated by the pressure for increased machine tool capacity created by defense requirements.

Because additional machine tools were not available in sufficient quantities, the logical procedure to meet the emergency of larger production was to step up speeds and feeds on existing machines. The operating characteristics of the carbide tool made it a real factor toward accomplishing this end. With the manufacture of high speed steels at a peak, the carbide tool came naturally into its own for those metal cutting operations where such greater speeds were attainable.

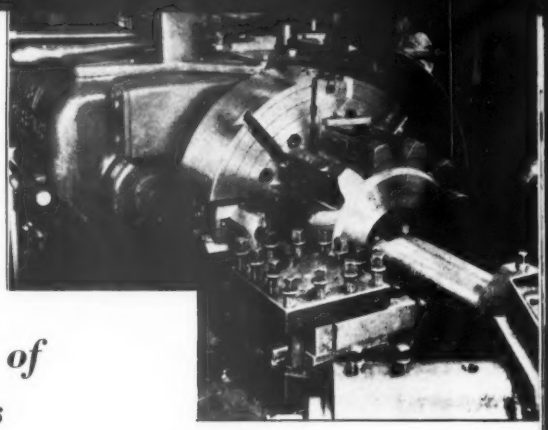
The first of the cemented carbide tool materials, tungsten-carbide cemented with cobalt, has been widely applied in the past ten years to machining of metals of low tensile strengths, such as cast iron, brass and aluminum. Carbides of this type usually have a tensile strength of less than 40,000 psi, and cut with a crumbly chip. A new conception of cutting speeds was introduced. Speed of cutting on cast iron, for example, was 200 to 350 fpm, or three to six times as fast as cutting with high speed steel tools. Tool life was many times that of steel tools on this work.

However, these tungsten-carbide compositions had a habit of adhering to steel chips under tool pressures and temperatures, and "cratering" when it was attempted to employ them for cutting steel. In addition, the rupture strength of tungsten-carbide compositions was not sufficient to withstand the shock of cutting rough forgings or castings with sand holes, not to mention the interrupted cuts now taken with modern steel cutting carbide tools, on heat treated steel parts.

There is a fundamental difference in the way chips come off the point of a tool cutting low tensile metal, and in the chip action when machining steel and tough alloys of higher tensile strength. In cutting with crumbly chips, the frictional heat is produced close to the cutting edge and to carry away this localized heat the high thermal conductivity



The graph shows the speeds at which steel cutting carbide tools are usually operated as well as the speeds customarily employed in cutting steels with steelite or high speed steel tools.



On the machining operations — turning, facing and boring over interruptions and sand holes — on low alloy cast steel rack pinions, carbide tools gave five times the production and pieces per grind given by high speed steel tools. Speed of cut — 155 fpm — feed .032″ — depth of cut from ¼″ to $\frac{5}{16}$″.

Requirements of Carbide Tools

Gaylord G. Thompson

of carburized tungsten and cobalt composition—about 0.17 cal/cm/deg C/sec, or 2½ times that of high speed steel—is helpful.

By thermocouple methods, using the work-piece and the tool material as dissimilar elements, a temperature of 1400 F was observed at the point of the tool when turning close grained cast iron at a speed of 400 fpm.

But in the machining of steel of tensile strength varying from 60,000 psi to 270,000 psi a stronger tool material was needed, one that did not "crater" due to the adherence of the steel chip particles to the tool point. The chip action in cutting steel is moved back considerably from the cutting edge, and localized heating is less a problem. In fact, it is advantageous to have a tool material which throws the heat back into the good conducting continuous chip, the tool and work remaining cool even at very high speeds.

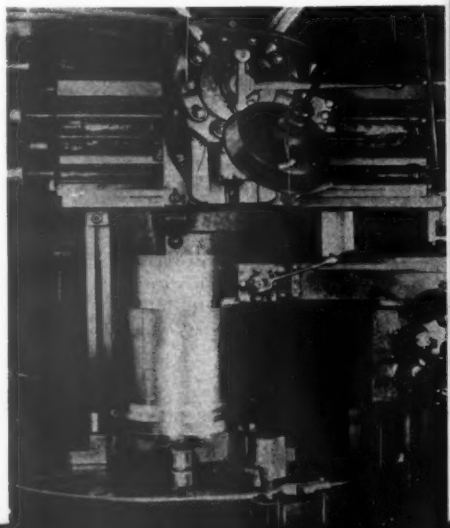
The development of a crystalline intermetallic compound, a double carbide of titanium and tungsten, corresponding to the chemical composition $WTiC_2$, and a harder material than tungsten-carbide, provided the answer. Compositions made from this ingredient, with binders of carburized tungsten and cobalt, the compositions being cemented in vacuum electric furnaces, were proved to have the requisite strength and hardness for the general machining of steels of a wide range of hardness, up to 550 Brinell.

The characteristics of this product, made in three grades of hardness by varying the proportions of ingredients, is shown in the following table:

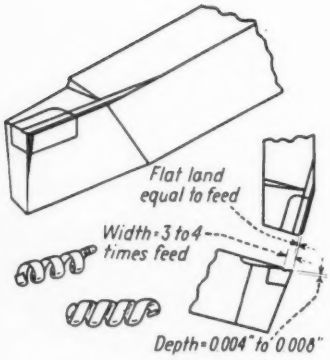
Grade	Rockwell "C"	Hardness "A"
KH	78.0	91.1
KM	76.6	90.6
K3H	79.0	91.6

Grade	Strength, psi Transverse Rupture	Thermal Cond. Cal/deg C/cm/sec
KH	244,000	.074
KM	305,000	.113
K3H	210,000	.068

For comparison purposes it may be noted that high speed steel has a hardness of 65 Rockwell "C" and a transverse rupture strength of about 450,000 psi.



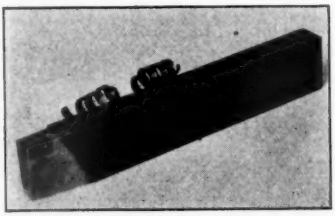
Turning and boring an SAE 3145 forging. Roughing speed 245 fpm — feed .033″ — depth of cut ¼″ to $\frac{3}{8}$″; finishing speed 290 fpm — feed .015″ — depth of cut $\frac{1}{16}$″. Use of cemented carbide tools cut time from 7½ hours to 3¾ hours.



This right hand tool, with chip breaker groove, produces short, coiled chips which break into easily removed lengths. This tool is efficient in turning most steels above .35 carbon and above 250 Brinell.

These steel cutting compositions have very high compressive strength, up to 690,000 psi. They have a certain degree of elasticity necessary for their use as steel cutting tools, not possessed by the more rigid cemented tungsten-carbide. Manufactured in vacuum furnaces and not sintered in hydrogen as is tungsten-carbide, they are free from localized embrittlement; consequently when ruptured by fracture they "flake" rather than shatter. Thus they may be reground many times in use as a tool. The surface characteristic of this fine-grained steel cutting compound is such that it does not adhere or "gall" on hot steel chips as it cuts them. Surfaces cut with these tools are typically smooth.

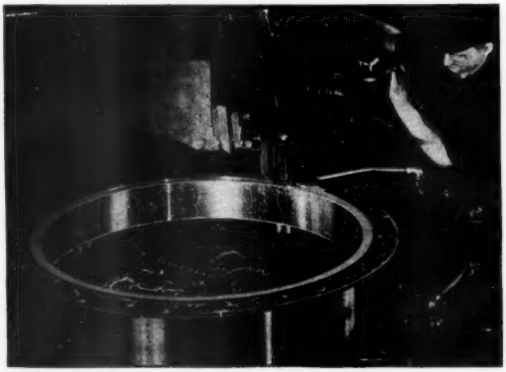
Research has established that efficiency in cutting metals is associated with low coefficient of friction between the tool surface and the metal being cut. A test of cutting efficiency is the freedom from "built-up edge" or tearing of the surface. This condition is typical of steel work cut with the steel cutting carbide tools.



A cemented carbide tool showing typical chips.

The design of lathe and boring tools made from the new carbide metal is a consequence of its characteristics. The favorable factors are its freedom from galling or built-up edge, its very high compressive strength, the hardness of the tungsten-titanium particles, and their suitable thermal conductivity. Its unfavorable characteristic is its lower tensile strength compared to high speed steel. Accordingly the design of the cutting point is made with a view of keeping the cutting portions under compression rather than tension. This is accomplished by using low rake angles and low clearance angles, by providing a more obtuse wedge or cutting angle. In

(Continued on Page 40)



Machining operations on this heat treated ring gear, 27½" diameter, included turning the inside and outside diameters and facing. Cemented carbide tools maintained such accuracy in bore that grinding was eliminated.

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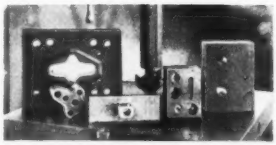

20 HOURS' WORK in 6 HOURS
By former method of drilling, slotting, shaping and milling, these parts would have taken 20 hours. DoAll did it in ⅛ this time.

• The parts shown above were cut in one eight-hour day on the DoAll. At least five days would have been required by drilling, shaping, milling and boring.

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A Reader Requested Article

Modern Precision Gaging in the Aircraft Industry

By Paul Poock, Sales Engineering Manager
Gage and Machine Tool Division
The Sheffield Corporation

UNTIL recently, the aircraft industry had none of those mass production problems which the automotive industry, for example, has been solving for the last decade. Neither, of course, did the aircraft industry enjoy the advantages inherent in mass production operations. Today the aircraft industry is, by necessity, a mass production organization, and it has been compelled almost overnight to change its production methods to meet current needs.

Aircraft inspection was largely carried on with practically the same leisure as that of the scientific laboratory. There were no drastic time limitations. The tremendous demands put on aircraft production have changed such procedure completely. Inspection equipment, as well as inspection operations, had to be put on a mass production basis.

In the construction of an average modern airplane approximately 15,000 precision measurements must be taken, nearly twice as many as that needed in building an automobile or a truck. This gives us some idea of the importance of speed in aircraft inspection—speed with precision.

The aircraft industry is using gages and instruments developed originally to meet similar requirements of high accuracy and speed in the automotive and domestic appliance industries.

Pistons Checked with Comparators

Fixed size gages, go and no-go plugs, rings, snaps and length gages, are rapidly being replaced as far as practicable by more rapid gaging equipment and equipment which provides the means for classification. On such a basis, machining operations are greatly facilitated without any increase in tolerances. Classifying parts in this manner requires gages of the comparator type.

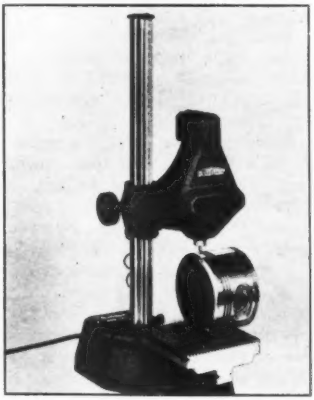
In the inspection of pistons in quantity, for example, the comparator of the Visual Gage type, which uses precision gage blocks as a reference, is used for checking operations which include the outside diameter taper, out-of-round and piston pin hole, the height and parallelism of top and bottom.

The Visual Gage

The Visual Gage with standard anvil is used to measure external dimensions, outside diameter taper, out-of-round and the angular relationship of surfaces. It is built around two simple basic ideas,

An operator is shown setting a Visual Gage with precision gage blocks preliminary to checking operation. Once the gage is set to blocks or masters an operator can hand load it at rates as high as 3,000 per hour, classifying work pieces to half a "tenth".

the Reed Mechanism and the weightless light beam lever arm.



The Visual Gage is being used to check the diameter of a piston. Handling a wide range of work pieces, this gage is accurate down to millionths of an inch.

The Reed Mechanism, the simplest mechanical device yet evolved for the magnification of very small movements or distances, essentially consists of two metal blocks, one fixed and one floating, joined by special alloy steel reeds. The gaging spindle, with its diamond pointed gaging member, is an integral part of the floating block. The floating block is connected horizontally with the fixed block by two reeds. The fixed block is rigidly anchored to the gage head case. When spindle and block are moved upward in the gaging operation, the horizontal reeds deflect slightly, but the vertical reed on the floating block tends to slip past its companion. As the vertical reeds are joined at their upper end, they do not slip, but swing together through an arc. The pointer or target, being an extension of the vertical reeds, swings an amount proportional to the distance the floating block moves. A series of lenses projects the shadow of the target on the scale of the gage. Operators, hand loading the Visual, can classify parts to half a tenth at rates up to more than 3,000 per hour.

The Internalgage

A very ingenious application of the Internalgage is gaging the internal diameter of an external ball race. The spindle of this Internalgage consists of a small diameter entering section at the forward or nose end. Behind this a taper increases spindle diameter to that of the gaging section.

A carrier, or fixture, with 4 caged balls 90 degrees apart around the circumference, is pulled over the spindle with the race in position just over the balls. As the carrier moves up over the taper and on to the cylindrical gaging section of the mandril, the balls come to full bearing in the race groove and the lower ball actuates the gaging point. In this position the carrier is rotated about the spindle. Any deviation from true race diameter is read directly on the scale of the Visual Gage.

This method of gaging exactly simulates actual ball race operating conditions, since the four point bearing gives a true dimensional reading of race diameter. The Visual Gage type of comparator is used also for the checking of bushings, both diameters and length—also

An internal attachment of a visual gage, as shown, is used to check hole diameter, taper and out of round. The attachment is adaptable to diameters from .315″ to 6″.

shafts, tappets, valves, piston rings and connecting rod bearings. With special fixtures, angularity between machined faces and concentricity are also checked on the Visual Gage.

Air Gages for Internal Diameters and Long Bores

Recent developments in the use of air flow at constant pressure as a means of gaging internal diameters, especially long bores, have given the aircraft industry a most valuable instrument for rapid precision inspection. The Precisionaire is a good example of this. This flow type air gage is used by aircraft engine manufacturers to check oil line holes; long holes in engine blocks, through or bottomed; a series of holes on the same axis; cam and crank shaft bearings; connecting rod bearings and bushings of various kinds, both before and after assembly.

The production of small arms and artillery has focused attention on the problem of the precision checking of gun barrel diameters. As the ratio of bore length to bore diameter is small on modern armament, the accurate checking of inside diameters is a very difficult one with the usual internal gages. Checking gun barrels with conventional gages requires a very high degree of skill. The Precisionaire indicates not only the interior diameter to any degree of precision desired, but also the location and the amount of out-of-round, taper or bell mouth condition that may exist. Unlike previous conventional gages, it reflects the condition of every increment of length throughout the bore without the necessity of taking a series of separate readings. It is much faster than any other long bore gage now in use, and it eliminates the human equation in gaging.

It may be used just as readily to check internal diameters of parts still mounted on the boring machine as to check finished parts. It is one of the few means of investigating the condition of very small bores in relatively inaccessible locations or those in parts that are awkward and difficult to handle. In some cases it may be used to check the alignment of holes also.

In cases where the inner circumference of a bore is more critical than its actual diameter, such as a thin walled, easily distorted bushing, which will eventually be pressed into a rigid casting or other assembly, the Precisionaire furnishes a more accurate check because it can be made to measure the average diameter of the bushing from end to end instead of the actual diameter at any given point. The use of this air gage imposes no distorting pressure on the piece being gaged.

The Precisionaire utilizes no contacting fingers or hard gaging points. Consequently it is ideal for use in inspecting bores, the interior finish of which is vitally important. It will not scratch such surfaces. In fact, the gaging nose may be equipped with bronze or silver rings as a further protection against surface damage.

Parts such as crankshafts and cam shafts have a number of dimensions which must be held to close tolerances. Obviously, when all these bearing diameters can be checked in one operation, inspection time is reduced to only a small fraction of that needed to check each diameter separately.

(Continued on Page 38)

The newly developed Precisionaire is especially adaptable for checking long holes in engine blocks, a series of holes on the same axis, cam and crankshaft bearings, and bushings of various kinds. An operator is checking the bore of a machine gun barrel.

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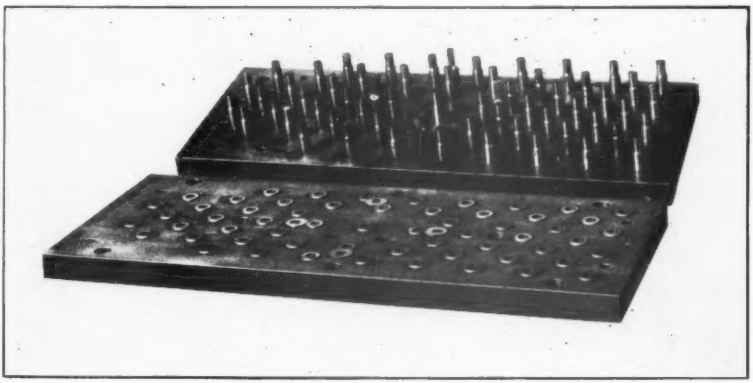


THEY FIT RIGHT
THEY HOLD TIGHT
•
THEY CHANGE QUICK
THEY WORK SLICK

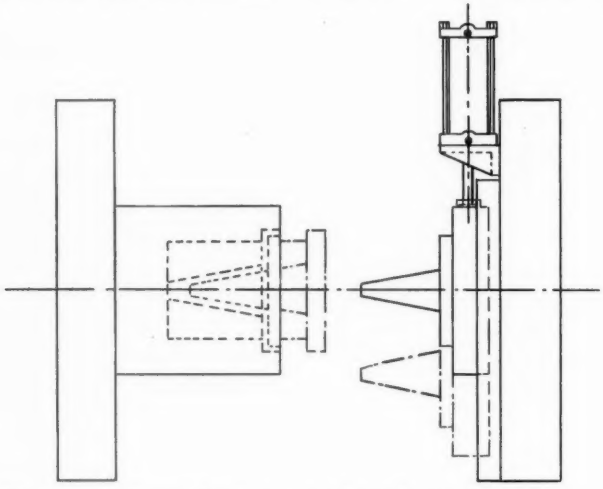
Air Cylinder Greatly Facilitates Ejection in Deep Cavity Plastics Molding

By Gordon B. Thayer

WHEN the daylight opening of an injection molding press is insufficient to allow the removal of a long casting from its deep cavity it is often possible to slide one half of the mold laterally and so provide enough room to get the casting out. In extreme cases the cavity half which retains the casting may be pushed out on slides and then the casting is ejected by means of a rack and pinion ejector. It is better, however, to slide the core half, or the part which is fastened to the stationary injection end platen, out of the way and make use of the ejecting power of the molding press. This is accomplished by mounting the cavity half of the mold in a fixed position on the movable press platen where the mold can be moved back relative to the ejector mechanism. Then the other half of the mold is the only half free to slide because the cavity half is held laterally by the ejector rod which projects through the press platen.

The arrangement shown in the accompanying diagram is in accordance with the preferred method described above. The injection half of the mold, on the right, is mounted on the stationary platen of the press, and is moved back and forth by means of an air cylinder.[1]

The piece to be molded is a large tank agitator made of chemical and water resistant material, the properties of which are obtained in a thermoplastic material. The use of an injection mold is indicated because the material is thermoplastic and because the compression mold for the piece would require more steel to provide enough core holes for heating and cooling, and because a compression mold would be much slower in operation on account of the very large mass of steel to be heated and cooled every time a



The air cylinder, right, is mounted on the stationary press platen and moves the injection half of the mold laterally permitting economical space design for manual unloading.

(Continued on Page 32)

[1]The air cylinder installed in this case was a Tomkins-Johnson. Full details of this cylinder are in Catalog H-40.

MORE and more tool rooms and die shops are taking advantage of Duro Hand Grinders to speed up production. These grinders have surplus power, the Heavy Duty Grinder a 40 watt output, the Streamline Grinder a 17 watt output. Both Grinders turn 24000 RPM, enabling work to be turned out faster, better and cleaner. They are designed and built to give long trouble-free performance. They have power — speed — precision — compactness — balance and streamline design — everything needed to improve tool maker's work and save much valuable time. You can get immediate delivery in any quantity. Send for literature today.

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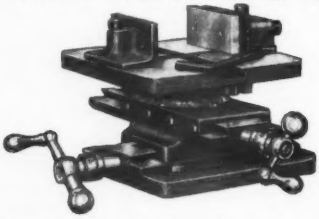
Atlas Press Announces Universal Compound Vise

A NEW universal compound vise, W68, just announced by Atlas Press Company, is a versatile fixture that handles all types of accurate indexing, layout



and spacing work—straight lines, radial or circular. The new vise is built rigidly to permit adapting drill presses to light milling operations. It can also be used with shaper, milling machine, lathe and grinder for any jobs that require accurate feeding in two directions.

The bottom of the rugged base casting is machine-ground—four flanged slots are provided for bolting or clamping to drill press table or base. Upper slide is graduated 90 degrees right and left, allowing the vise table to be rotated and set accurately at any angle. Upper transverse and lower cross slides travel on dovetail ways which are machined and hand-fitted. Feed screws have Acme threads, ball crank controls with take-up and steel collars graduated in thousandths.

The table casting, also machine-ground, is locked to the upper slide by two socket head cap screws. Four T-slots for positioning and locking vise jaws extend from the table center to edges. Each vise jaw is locked by a socket head cap screw. One jaw is swivelled to grip irregular work; the other has a movable face, which is tightened against the work after both jaws are clamped to the table.

A new circular gives full specifications and price of the new Atlas Universal Compound Vise, W68. A number of tool room applications are illustrated and described. For your copy of this Bulletin, write Atlas Press Company, 512 N. Pitcher St., Kalamazoo, Mich.

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KENNAMETAL is harder than the hardest tool steel (grade KH is 78 Rockwell "C"); consequently, KENNAMETAL tools are never heat treated. Simply braze a KENNAMETAL tip on a recessed shank, sharpen, and put to work.

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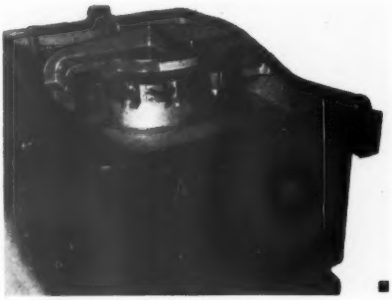
KENNAMETAL machines steel of all hardnesses up to 550 Brinell, at economical high speeds, and with minimum tool wear. As a result, it is seldom necessary to anneal work pieces before turning, boring, facing, or shaping with KENNAMETAL tools.

Send today for our new Catalog No. 41 containing specifications and prices for standard KENNAMETAL tools. Complete instructions for brazing your own tools with KENNAMETAL tips are included.

McKENNA METALS Co.
500 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

Broaching Slots in Timing Disc Bushings

BROACHING slots in brass timing disc bushings at a rate of 2000 completed pieces per hour is the record made with a special American 16" rotary Bench Type Broaching Machine. A twelve-station fixture, as shown, was arranged for manual loading. The operator loads the parts into stations continuously. The fixture automatically clamps the parts as the table revolves. The machine automatically ejects the completed parts. A machine steel broach holder is provided with taper wedge adjustment behind the broaches.



The operator starts the machine by means of a push button (shown at the right front of the machine) after which the machine operates continuously.

The slot in the timing disc bushing was broached completely in one revolution of the table—in 20 seconds. When the automatic fixture cam support shown in the photograph is not used, 180 degrees of arc is available as space for the broach holders. Broach holders are adjustable for convenience in setting up and adjustment of the broaches.

The American 16" rotary Bench Type Broaching Machine has all moving parts, motor, motor drive (V-belt to worm and worm wheel to spiral reduction gears which drive the work table through pinion engaged in large internal gear in the table), coolant system, chip receptacle and lubrication unit enclosed within the machine column. The main spindle is provided with a taper roller bearing at each end, designed for take-up. The motor

(Continued on Page 32)

A Starrett S-M Molybdenum Hacksaw Cutting 10" x 12" Blocks of Molybdenum steel for drop forging dies.

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Air Cylinders to Eject Molds

(Continued from Page 28)

casting is molded.

The cavity half of the mold is mounted on the movable platen of the press and the usual design of ejector box is employed. The design of the casting, however, is modified to allow more than the usual amount of draft on blades and hub so that the piece can be ejected only part way to a point where it will be loose and will have enough projecting for the operator to grasp. This is done for two reasons. The piece is rather heavy and it should be removed manually to prevent its dropping out of the mold and breaking or becoming scratched. Also, the casting is too deep for practical ejection all the way out, as the length of ejector box required would make the mold extend out too far and would take up space needed to get the casting out of the press. The broken lines in the left hand view show the casting as pushed out by the ejector and in a position to be removed by the operator.

The core half of the mold is mounted on the stationary injection end platen of the press, as shown in the right hand portion of the diagram, which is a plan view of the mold and press in the open position. The air cylinder which slides the mold half back and forth is mounted at the rear by means of a bracket which is bolted to the press platen. The piston diameter of the cylinder is 2″ and this provides about 250 pounds force when air pressure is 80 psi. The cylinder is mounted close to the sliding mold half to reduce length of connecting rod and to increase rigidity and conserve space at the rear of the press. The mounting bracket is of welded cold rolled steel which requires no machining except drilling the holes for screws to hold it to the press platen and to the flange face of the air cylinder.

The air cylinder is a standard model with flange face at the rod end. The bracket is substantially built and the dimensions are carefully worked out to make the unit adaptable to other molds of the same type.

The connection between the air cylinder and the mold is made by means of an adaptor rod which is screwed into the piston rod at one end and which is held to the mold by means of a shoulder at the other end. The shoulder is retained by a mounting box which is fastened to the sliding core retainer plate with screws.

The air cylinder is operated by a foot operated valve. The operator pushes the operating pedal after the press is completely opened and as he is moving aside the safety fence with his hands. When the safety fence is moved out of position, the power of the press is locked, and the operator can safely reach in to remove the casting. The broken lines in the right hand view show the core block as it is moved aside to clear the casting. The air cylinder, to be flexible for a wide range of jobs, should be equipped with a speed control valve.[2]

The use of the air cylinder saves the time required for the operator to pull the sliding mold half to the clear position, and to push it back to the molding position. The force of the air cylinder is applied in the proper place, and the sliding motion is accomplished without binding due to eccentric application of the force. This reduces wear and tear on the mold set-up, and insures long runs without having to readjust the gibs and slides.

[2]Bulletin SC-1, "T-J Speed Control Valves for Air and Hydraulic Cylinders," gives design information.

For Catalog H-40 or Bulletin SC-1, write The Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

Broaching Slots in Timing Discs

(Continued from Page 31)

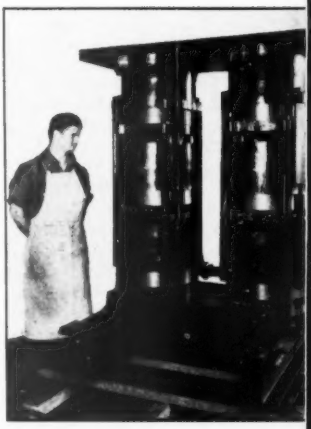
mounting V-belt is also provided with a take-up.

For specifications and specific information on the production capabilities of the American 16″ rotary Bench Type Broaching Machine, write American Broach & Machine Co., Dept. TD, Ann Arbor, Mich.

Durez Opens Phenol Plant

A recent issue of Durez *Plastics News* contains a very interesting story on the new plant and the Raschig process used in the production of synthetic phenol, a major raw material in Durez. An article on design, a question and answer section and examples of new products molded by Durez add to the interest for the shopmen who either build molds for plastics or who do custom molding. The new phenol plant, built at a cost of $2,000,000, is the largest of its kind in the world.

New Pneumatic Die Cushions for Extreme Holding Pressures



THE Dayton Rogers Manufacturing Company, Minneapolis, Minnesota, have produced a new design of Pneumatic Die Cushion known as Model CCC. These cushions, furnished in double tandem units, are primarily designed for extremely heavy ring holding pressure on large double-throw, single-crank presses. They can also be used advantageously on double-crank, double-throw presses.

The photograph showing the double tandem set-up is that of the first successful installation now in production. The Model CCC Die Cushion was designed to meet a defense program need.

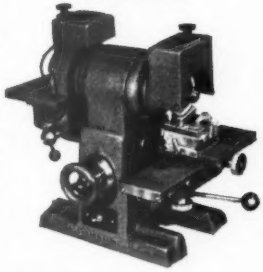
The Model CCC Cushions are supplied with a combination regulating valve and pressure gage that controls and regulates all working draw ring holding pressures. The design of the cylinder section of the Pneumatic Die Cushion automatically shields the working parts of the cushion cylinders so that no pierce slugs nor loose parts can come in contact with the cushion unit. A pit is usually provided on the larger presses for these larger tandem cushions. The cushion equipment comes complete with a remote centralized lubricating block or header.

This type of Pneumatic Cushion equipment has ring holding pressure from 25 to 100 tons controlled by an automatic reducing regulating valve.

For more complete information on Model CCC Pneumatic Die Cushions as well as engineering data on how these cushions will help solve your problems, write Dayton Rogers Mfg. Co., 2830 13th Ave., S., Minneapolis, Minn.

HAMMOND "4" CHIP BREAKER GRINDER

"By-Guess-and-by-Gosh" grinding of Chip Breakers into Carbide Tools has no place in Defense production. You'll get hair-line precision with HAMMOND'S Modern "4" Chip-Breaker Grinder. Three planes of adjustment with the new ANY-ANGLE vise. Left side of machine rough or finish grinds . . . right side grinds chip-breakers. Here's complete Carbide Tool maintenance. Write for Bulletin GP-5.



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Eastern Branch: 71 West 23rd Street, New York City

"Plastics Mold Designing"

THE appearance of the first book which treats this subject exclusively would be an event of importance under normal conditions. At present, under the pressure that the National Defense Program is making on the plastics industry to design and build literally thousands of items formerly made of the metals now unavailable because of defense priorities, it is particularly timely. "Plastics Mold Designing" is a systematic, comprehensive survey of modern plastics mold design written by a practicing mold engineer.

Types of compression and injection molds are treated—with assembly and detail drawings of each type. Details are completely identified in each case. Special attention is given to design points peculiar to molds for plastics materials. The relationship to standard die practice is constantly pointed out. Recommendations of metals with suggestions on machining, heat treatment and finishing operations are of particular value to the experienced tool and die maker.

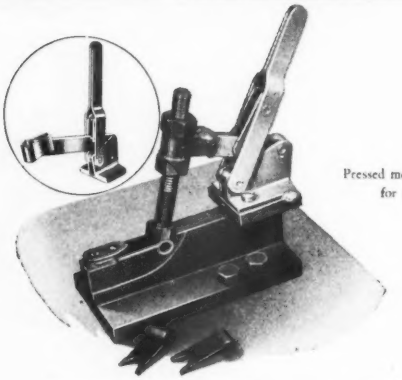
Chapters on design procedure and mold building equipment and machinery add to the practical value of the book. A six-part section on mold steels, written by specialists of leading manufacturers of these steels and four-place shrinkage charts are included.

An outstanding feature is the Nomenclature of Plastics Molding — the largest and most complete ever published. Compiled with the cooperation of fourteen leading plastics authorities representing practically every important molding center, the Nomenclature effectively bridges sectional differences in terminology.

Introduction by Scribner

The Introduction is by George K. Scribner, President, Boonton Molding Company and Secretary, Molders Section, The Society of the Plastics Industry.

"Plastics Mold Designing" is available in two bindings, a cloth board cover at $2.50 and a durable paper cover at $2.00. Price includes delivery. A discount on quantities is available for industry apprentice training programs, schools and libraries. The book is published by American Industrial Publishers, 325 Fairmount-Cedar Bldg., Cleveland, O.



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Bulletin No. 40, showing sizes and giving detailed specifications, will be sent you on request.

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Defense Notes

"Priorities and Defense"

A HANDBOOK on the operation of the priorities system is now available for general distribution upon application to the Division of Information, Office for Emergency Management, new Social Security Building, Washington, D. C.

Called "Priorities and Defense," the booklet includes a general statement on the theory and administration of the priorities system, a question and answer section, a copy of the Priorities Critical List, the official instructions on priorities to Supply Arms and Services of the Army and Bureaus and Offices of the Navy Department, reproductions of preference rating forms, and other material.

Defense Contract Service

The Defense Contract Service, set up by the Office of Production Management, with the cooperation of the Federal Reserve System, is a clearing house of information regarding prime defense contracts and the subcontracts into which they are divided. Established to be of maximum usefulness to prospective contractors and subcontractors, the six sections of the Defense Contract Service are rendering information on contracts, procurements, subcontracting and financing. Thirty-six regional offices, one in each of the 12 Federal Reserve Banks and their 24 branch banks, are in operation. Complete information will be given on application.

"Farming Out Methods"

"Farming Out Methods", Farming Out Bulletin No. 5, published by the Labor Division, Office of Production Management, outlines the subcontracting methods of such companies as the Sperry Gyroscope Co., The American Machine & Foundry Co., Kearney & Trecker Corp., and William Sellers & Co. The York Plan, developed by the York Safe & Lock Co., is given in some detail. The Connecticut Plan, which has proven so successful, is also outlined.

"Defense Job Training"

"Defense Job Training", a condensed

(Continued on Page 39)

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For high hardness with oil quenching . . . . for deep penetration with minimum distortion or deformation . . . . use Ryerson RY-ALLOY. It's easy to machine and holds a fine cutting edge under rough treatment. RY-ALLOY is a non-shrinking, non-cracking alloy steel. You'll find it economical to use for all general purposes.

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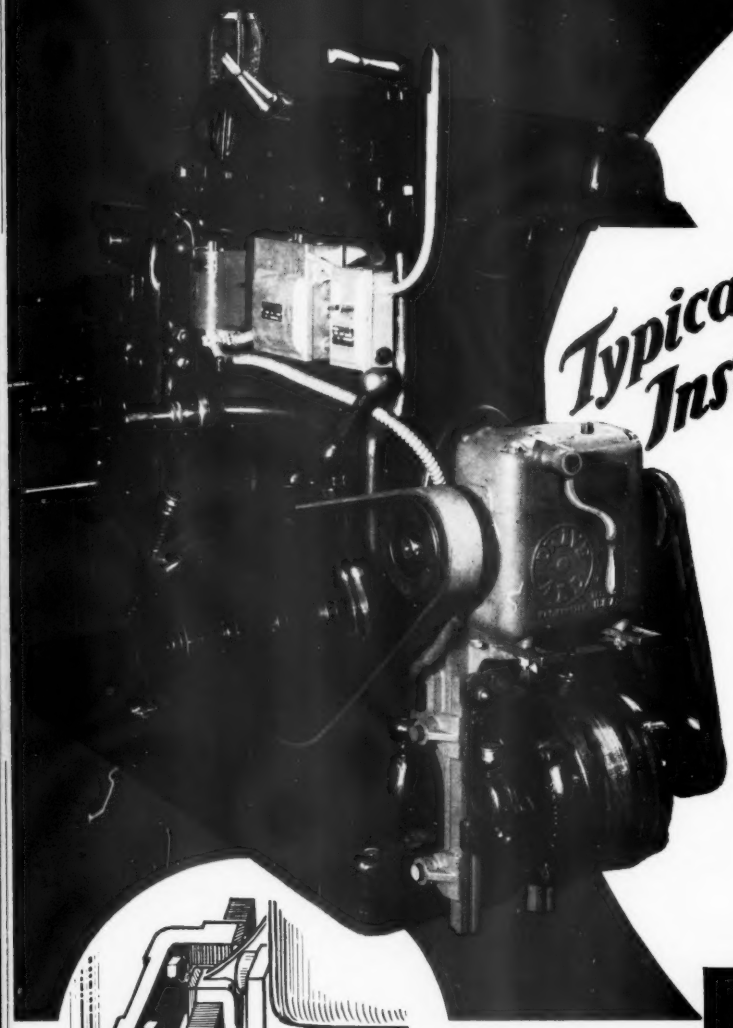

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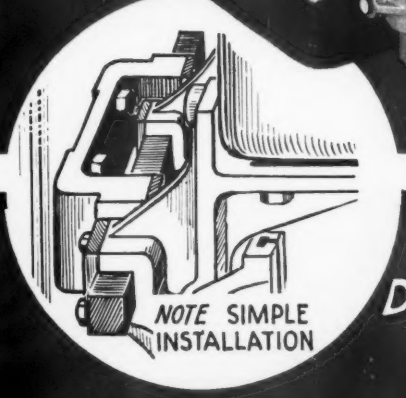

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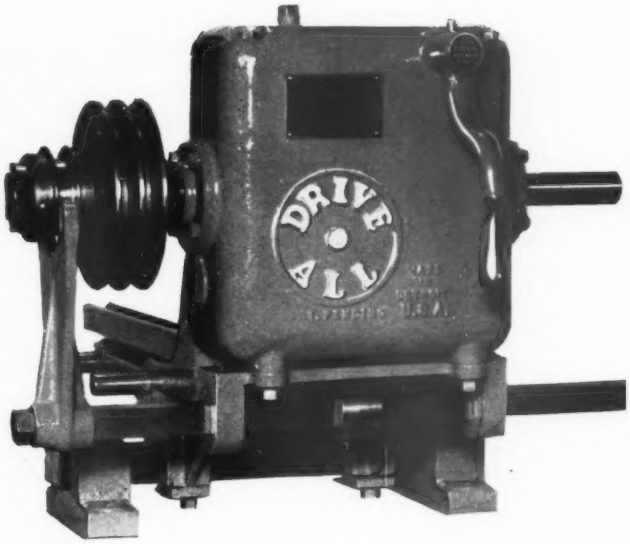

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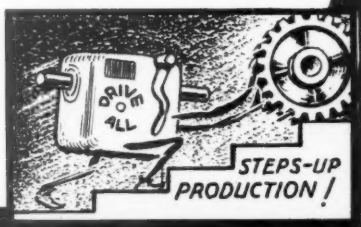

RIVE-ALL

UFACTURING COMPANY

Conner Ave., Detroit. Mich.

Precision Aircraft Gaging

(Continued from Page 26)

The Multichek Electrigage is a precision instrument for the rapid inspection of mass production parts having several critical dimensions, as, for instance, the several diameters and shoulder lengths of an armature shaft or crankshaft bearings.

Measurements of length, diameter and depth are flashed simultaneously on a control board by means of colored signal lights as the part being inspected is placed in gaging position. An individual gaging head is incorporated for each dimension to be checked and each head actuates a signal light.

When one of these signal lights shows amber in the gaging operation, its diameter is within tolerance. When the light shows red it indicates the diameter is undersize and when green, oversize.

In addition to the individual signal lights (one for each measurement), this gage may have a master signal light which integrates all measurements. When the master signal shows white, all dimensions are within tolerance. When it shows red, the individual signal lights are observed in order to determine which dimension or dimensions are incorrect and whether they are plus or minus.

These instruments can be used on parts as large as desired and are being used on minute parts such as a pinion less than ⅛" long overall and less than $\frac{3}{32}$" in diameter. The diameters of both end trunnions are measured for diameter and at the same time the length of the pinion portion is checked.

Although there is always a locating fixture to position the work part for the gaging operation, the gaging points are not dependent on correct positioning because they float on steel reeds and each is entirely independent of all the others. Thus, correct readings are secured consistently on each diameter regardless of all other diameters.

The Electrigage head is so designed that it can be applied in innumerable combinations. One feature of considerable economic value is that each Electrigage head is a self-contained unit and if, at any time, the line of work upon which it is used changes, the head can be dismounted and applied elsewhere.

ALLENS

pack the strength *with accuracy* for close-tolerance work

For accurate locating of work and rigid retention of assemblies, Diemakers specify "ALLENS",—the *complete* line of Hexagon Hole Products and Diemakers' Accessories, 30 years in the making by *Specialists.*

The Hollow Screws are made from ALLENOY steel, heat-treated, instrument-tested for each physical property, and individually hand inspected. Thread-accuracy has been brought to perfection with Allen-developed lead screw threading machines and the new "Duo-process". Sockets are true and clean. Heads always concentric with screw bodies.

The Dowel Pins (like the Hollow Screws) are made from ALLENOY steel, ground to close tolerance limits, with tensile strength of 240,000 to 250,000 lbs. per square inch.

Full technical data in Folder GT-21,—mailed to you on request.

Call your local Allen Distributor for free samples and service.

THE ALLEN MANUFACTURING COMPANY
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Sheldon Announces 11" and 12" Lathes

THE Sheldon Machine Company, Inc., announces that their new 11 and 12-inch lathes, with pre-loaded ball or precision roller bearing headstocks, will have a 1-inch capacity spindle hole having 1⅜ inch diameter.

These new lathes will be moderate in price and will come in both bench and floor types with semi-quick or full-quick change gear boxes; with plain aprons or worm feed aprons; with power cross feed; with a choice of motor drives, including the Sheldon needle bearing over-head motor drive; and the Sheldon 4-speed lever, operated underneath the motor drive, entirely enclosed in a cabinet leg.

A complete line of attachments and accessories is available.

For complete specifications and prices of the new Sheldon 11 and 12-inch Lathes with 1-inch collet capacity, address Sheldon Machine Co., Inc., 1622 N. Kilbourn Ave., Chicago, Ill.

Defense Notes

(Continued from Page 35)

chart-guide to defense training opportunities in programs sponsored by 6 Federal agencies, has been compiled and issued by the United States Office of Education. Covering 24 training programs, the chart-guide includes the number to be trained or in training in fiscal year 1941, wages or fees in training, wages on job, persons eligible, length of courses, where offered and where to apply. Copies of the chart are available at 5 cents from the Superintendent of Documents, Washington, D. C.

Let us Check your Gage Blocks

JOHANSSON GAGE BLOCKS are vital to defense production. They should be verified frequently, just as your inspector checks his micrometers.

It is just possible that wear or injury to which your Gage Blocks are subjected may impair their accuracy and reflect on your product. You can take a simple precaution, and fully safeguard your precision through our inspection facilities, which are available at quite nominal charge.

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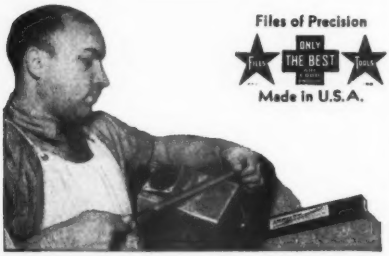

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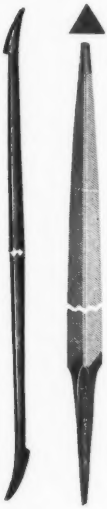

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AMERICAN SWISS
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Steel Cutting Carbide Tools

(Continued from Page 22)

fact, for interrupted or "jump" cuts, negative rake angles are successfully employed, making the included angle between the top surface of the tool and the front clearance actually greater than 90 degrees.

It has been estimated that the use of tungsten, in the form of tool tips of cemented carbide, results in 20 to 60 times as much work done per pound of tungsten as when this strategic material is employed in tungsten high speed steel. Not only does the raw material go further in producing work, but it does that work with a 30 to 50 percent saving in time.

Machine tools must have both the speed and power required to get the full benefit out of steel cutting carbide tools. Recently a prominent machine tool manufacturer built an automatic machine for machining of steel housings. An alert executive noted that the machine was built to use high speed steel tools and that it had a maximum speed of only 90 fpm on the largest diameter to be bored. In spite of the fact that the machine was completely assembled and ready for final painting, it was disassembled, redesigned and the power and speed stepped up to a capacity of 290 to 300 cut-feet per minute. The steel cutting carbide tools gave such gratifying results in reducing production time and in the excellence of the finished work that the redesigned speed and power characteristics have been standardized on this machine.

To attempt to use carbide tools on a machine that has no more speed than is necessary for high speed steel cutting tools is to invite failure. When a high speed tool dulls too quickly, the operator usually will reduce the speed. This procedure cannot always be applied to steel cutting carbide tools. A very large percentage of apparent failures of carbide tools is due to the fact that too slow a speed is used.

Steel cutting carbide tools will not produce a good finished surface unless there is enough stock to keep the nose buried in the steel. A superintendent who was using steel cutting carbide tools for turning drop forged steel shafts complained he was not able to get a good

(Continued on Page 42)

Challenge Develops New Line of Bench and Surface Plates

THE current speed-up in industrial production makes it necessary to have smooth, accurate working surfaces for inspection, layout, assembly, model work, pattern making and mounting of small machines.

To meet this need, The Challenge Machinery Company, Grand Haven, Mich., has developed a line of semi-steel bench plates, two and four inches thick, with planer finish.

These Challenge Bench Plates are made of iron and steel with sides and top at exact right angles. The under side has heavy cross ribs to provide a firm support for the top surface. The four-inch plates are made in three sizes and the two-inch plates in six. Special sizes in either thickness can be made to order.

In addition to bench plates, Challenge also furnishes six-inch layout surface plates, lapping plates, hand-scraped semi-steel surface plates for tool making, cast iron top benches, and other time and labor-saving devices for the die and tool making and machine industries. These plates are made of close-grained semi-steel, specially treated to overcome strains in casting and machining and to avoid distortion after scraping. The design provides rigidity and strength. A felt-lined wooden protective cover is furnished with each plate.

The complete line of Challenge Semi-Steel Bench and Surface Plates is illustrated and described in the latest Challenge Catalog 1342-T, a copy of which will be forwarded at your request. Address The Challenge Machinery Co., Grand Haven, Mich.

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150% LONGER LIFE

Rigid tests on snagging and exacting operations prove they have 150% to 300% longer life. Won't ridge on welds, sharp corners, sinking dies, barbering, etc. There's a shape and size to handle every grinding job faster, better, at lower cost. V/T Super Bond is the most important development in mounted wheels in 30 years.

Let us send you a trial Wheel. Tell us the kind of job, type of equipment you use and size wheel you prefer.

Free Mounted Wheel Chart

Ideal for ready reference in the shop. A Wall Chart 22 x 15" showing actual size and shape of every standard Chicago Mounted Wheel.

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A small "power house" that can be used wherever there is an electric outlet. Grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. Weighs 12 oz., 25,000 r.p.m. $18.50 postpaid with 7 accessories.

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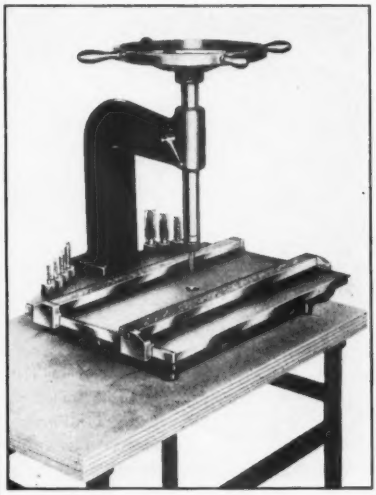

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Spindle lock for holding spindle in position.
Two spindle bearing bushings hardened, ground and lapped.
Aluminum handwheel with four inserted steel handles.
Bracket arm, semi-steel casting bottom scraped to insure spindle is perfectly square with base.

Send for Circular

THE VIKING TOOL & MACHINE CORP.
6 Main St. Belleville, N. J.

Steel Cutting Carbide Tools

(Continued from Page 40)

finish with the tools. Investigation showed that the shafting had less than ⅛" stock to turn off and that in many cases this was insufficient to clean up. Also, it was shown that the maximum speed was only 70 cut-feet per minute, the capacity of the belt-driven lathe.

The forging dies were changed to allow approximately ⅛" stock for machining. A larger drive pulley on the line shaft to give a cut-feet capacity of about 200 fpm was substituted. The result was not only a 60 percent gain in production, but a finish so smooth that the grinding operation required previously was not necessary.

The cost factor of machining with carbide tools should be analyzed carefully. The number of pieces that can be machined per sharpening of the tool and the total number of pieces that can be machined with one tool until it is discarded must be a matter of deciding whether maximum production or maximum tool life is more important.

Unlike high speed steel which burns away when it gets dull, steel cutting carbide tools will cut even to the point of stalling a machine before the operator becomes aware that the tool is dull. The highly burnished machined surface or the telltale sing-song of the dull carbide tool is often overlooked by the operator in his desire to keep going under the pressure of piece-work as long as the tool produces chips. If the machine does not stall under such circumstances, a broken carbide tip is inevitable. A definite maximum as to the number of pieces to be machined with each sharpening of the tool should be set.

When carbide tools are permitted to cut steel too long, it will take two to six times as long to resharpen them. Use of dull carbide tools reduces the total tool life as much as 20 to 75 per cent.

Unusual Lathe Available

A quite unusual type of lathe with 68" swing and 22' bed is offered by Bradley Machinery Company, Detroit. This lathe is particularly suited for swinging crankshafts or other heavy forgings or castings. It is available for immediate delivery. Get in touch with Bradley Machinery Company at 215 Jos. Campau, Detroit, Mich.

AcromarK Announces Process for Marking Enameled Metals

A NEW method of marking enameled metals without engraving has been discovered by The AcromarK Corporation. The process consists of a steel die application to the coated metal under electrically controlled conditions and the mark of metal or color pigment results. This new method reduces the marking time by at least ten to one and gives more attractive results. Roxalin metal coatings are used.

Binocular parts, enameled tubes, camera parts, instrument cases and a wide variety of enameled metal products can be trade marked, numbered or otherwise marked by this new process. A special machine to simplify the marking procedure has also been developed by AcromarK.

First applications of the new process were on army binoculars and cameras for the British Government. Experience to date indicates that the method should very greatly reduce the cost and production time of numerous instruments and articles vital to Defense.

For full particulars on both the new marking process and the machine to accomplish it write The AcromarK Corp., 261 N. Broad St., Elizabeth, N. J.

Woodworth Organizes Suprex Gage Company

ANNOUNCEMENT of the organization of the Suprex Gage Company is made by N. A. Woodworth who founded the Ex-Cell-O Corporation in 1919 and served as its president until 1937.

William F. Klemm has been appointed general manager of Suprex which has acquired a plant at 420 Ten Mile Road, Pleasant Ridge, Michigan. Mr. Klemm was the organizer of the Metro Tool and Gage Company of Chicago, and formerly associated with Mr. Woodworth of Ex-Cell-O and has had extensive experience in gage manufacturing.

The production of plug and ring gages—straight and tapered, thread plug gages, and various types of carbide-faced gages is underway now, the company having acquired new equipment throughout, including the most modern temperature-control apparatus in its heat treating department. A department has been equipped also for salvaging all types of gages with hard chrome plating.

the first practical, authoritative, shop text

PLASTICS MOLD DESIGNING

by

Gordon B. Thayer

Written by a Plastics Engineer of recognized ability—each chapter checked by men actively engaged in all phases of the Plastics Industry.

All drawings, by the author, are fully detailed and are representative of the latest design and molding practice.

The 100-term Nomenclature was compiled with the assistance of 14 leading authorities, at least one in every important molding center.

Price $2.50 per copy, postpaid. Write for quantity discounts.

CONTENTS

Ten chapters on the design of typical molds for plastics — includes Methods of Mold Sinking — Suggestions on Design Procedure — Mold Building Equipment and Machinery.

A Six-Part Section on Mold Steels written by specialists.

Four-Place Shrinkage Charts.

Nomenclature of Plastics Molding.

AMERICAN INDUSTRIAL PUBLISHERS

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Recent Industry Publications

PRODUCTO DIE SETS AND ACCESSORIES—new Catalog No. 9 follows the same sectional arrangement of earlier catalogs with sections on Master Die Sets, Standard Die Sets, Special Semi-Steel Die Sets, All Steel Die Sets, Accessories, Attachments and Tools. An outstanding feature of the new catalog is that pages are laid out to give the tool designer and die maker all the essential information on **one** page. Essential dimensions are in heavy display type and are easier to read. The section on Accessories lists the new sizes of guide pins, bushings, wire springs, etc., to conform with new die dimensions. The Dickerman Hitch and Die Feeds, Bay State Hand Tapper, the Producto Utility Press, the Producto Machine Vises and other tools and accessories are included. Prices are shown throughout. For your copy of Producto Catalog No. 9 address The Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn., or 3017 Medbury Ave., Detroit, Mich. If you are closer to Cleveland write Die Supply Co., 1390 E. 30th St., Cleveland, O.

REX MM, TMO AND VM—Three folders just issued by Crucible Steel Company of America—describe three grades of molybdenum high speed steels—steels of particular current interest because of the impending shortage of tungsten. Each folder contains recommended services and complete heat treating data. Rex MM is a tungsten-molybdenum, Rex TMO is a molybdenum-tungsten and Rex VM is a molybdenum-vanadium high speed steel. Ask for all three folders when you write Crucible Steel Co. of America, Dept. TD, 405 Lexington Ave., New York, N. Y.

THE CLEVELAND NO. 1 VERTICAL MILLING MACHINE—Sommer & Adams' standard high speed vertical spindle milling machine is described in this 6-page circular. Design features and specifications are given. For a copy of the Cleveland Mill Circular write Sommer & Adams Company, 18511 Euclid Ave., Cleveland, O.

COPPER HEAD EXPANSION TAPS—Boyar-Schultz's expansion taps with patented non-reversible feature and the standard copper head taps are described with details of features of construction and operation noted in this 4-page folder. For your copy address Boyar-Schultz Corp., 2112 Walnut St., Chicago, Ill.

THEMAC HIGH SPEED PRECISION GRINDERS—Catalog T lists full specifications of the Themac line of high speed portable electric grinders with circumferentially adjustable grinding spindles. The line is complete, containing units for every type of tool room service. For your copy of Catalog T, write The McGonegal Mfg. Company, 393 Railroad Ave., E. Rutherford, N. J.

"ARE YOU TAKING FULL ADVANTAGE OF CUT-OFF WHEELS?"—This new Norton leaflet gives suggestions on how to get best results from your abrasive cut-off wheels, cites actual examples and gives tables of recommended cut-off wheels for both dry and wet cutting of tool room materials. For your copy of this leaflet ask your Norton man or write Norton Company, Worcester, Mass.

THE ARMSTRONG SYSTEM OF TOOL HOLDERS—Catalog C-39 gives complete information on the Armstrong Tool Holder System which includes tool holders for every operation on the lathe, planer, shaper, slotter, turret lathe, etc., with over one hundred modifications of shape and size. Prices are shown on specification pages. For your copy write Armstrong Bros. Tool Co., "The Tool Holder People", 340 N. Francisco Ave., Chicago, Ill.

WALTON TAP EXTRACTOR—Folder 132 lists the specifications and prices of both individual tap extractors and sets in 2, 3 and 4 flute styles. Instructions on the use of the Walton Tap Extractors and details on the 30-day Free Trial Offer are included. For a copy of Folder 132 write The Walton Company, 88 Allyn St., Hartford, Conn.

NEW HOLO-KROME BULLETIN—The new Holo-Krome Bulletin T gives full data on Standards with Socket Set Screws, Socket Head Cap Screws of the Hexagonal Socket Type and includes all dimensions of Heads, Bodies, Screw and Thread Lengths, Screw Points, Sockets and Keys. Designed particularly for convenience in ordering Set and Cap Screws, this Bulletin is a valuable addition to the Holo-Krome catalog. For your copy of Bulletin T write The Holo-Krome Screw Corp., Hartford, Conn.

GRAND RAPIDS HAND FEED SURFACE GRINDERS—A new Bulletin, GL-T, gives full specifications and illustrates the Gallmeyer & Livingston Hand Feed Surface Grinders No. 0, No. 15, and No. 18. These tool room units provide extra facilities for small work which could not be done economically on larger hydraulic feed surface grinders. For your copy of this Bulletin write Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.

"THE VITAL IMPORTANCE OF TIMKEN BEARINGS IN NATIONAL DEFENSE"—This attractive plastic ring binder Bulletin is liberally illustrated and details a number of the activities of The Timken Roller Bearing Company in the National Defense Program. The role of bearings in ships, guns, tanks, trucks, planes and in the tools which are used to produce them is given in considerable detail. For your copy write The Timken Roller Bearing Co., Canton, O.

MIDGET MILLING CUTTERS—Severance Toollog No. 13 is a broadside in color showing each of the principal types of Midget Milling Cutters, "Ground from the Solid After Hardening", manufactured by this company. Inside and outside deburring cutters, chatterless countersinks, and seating and facing cutters are also shown. For your copy of Toollog No. 13 write Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich.

T-J SPEED CONTROL VALVES—for air and hydraulic cylinders—are discussed in an attractively illustrated Bulletin SC-1. Mounted on the cylinder, the valve controls the speed of the piston rod while it is advancing out from the cylinder. The valves are sturdily constructed to withstand the severest use. Parts affected by wear are hardened and ground, except when made of non-corrosive metals.

(Please turn to Page 46)

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Recent Industry Publications

(Continued from Page 44)

Specifications are given for both the Speed Control Valves and the T-J non-rotating Double Acting Cylinders, which are made in seven standard styles. For your copy of Bulletin SC-1 write The Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

"NEOR" AND "COBALTCROM-PRK33"—Bulletins on these well-known steels—the first, the pioneer non-deforming oil and air hardening high carbon-high chrome alloy steel; the second, the patented non-scaling, non-deforming, oil and air hardening cobalt-chromium steel, are available from the manufacturer, Darwin & Milner, Inc., 1260-64 W. 4th St., Cleveland, O. Applications and general treatment instructions are given.

ZIEGLER ROLLER-DRIVE FLOATING TOOL HOLDER—New Bulletin gives full specifications, drawings and identification of all parts for the three types of holders in this line. Ziegler Floating Tool Holder is adapted to machines for single and multiple spindle tapping, reaming and thread-cutting with adjustable die heads or solid dies. Shanks are furnished to fit all makes of machines. For your copy of new Bulletin write W. M. Ziegler Tool Company, 1926 Twelfth St., Dept. 1, Detroit, Mich.

GAIRING STANDARD AND SPECIAL CUTTING TOOLS—New edition of Catalog No. 40 maintains the familiar three part division of this catalog—the Standard Blue Section, the Gair-Lock Brown Section and the Special Tool Green Section. The typical page of photograph, dimensional drawing, general information and specifications including list prices, with the quick-reference Alphabetical Index makes Catalog No. 40 convenient to order from. For your copy write The Gairing Tool Company, Roosevelt Park Annex, Detroit, Mich.

ONSRUD AIR GRINDER BULLETINS—Bulletins on the Onsrud B-1, MD-1 and the E-1, each giving detailed usage suggestions in tool and die grinding, are available. The smallest tool, the B-1, is designed for particularly fine work; the heavier, MD-1, has flexibility and power for a wider range of grinding wheel, rotary file and cutter use; the powerful Onsrud E-1 Air Grinder will do fast, efficient roughout work as it handles mounted wheels to 1" dia. and safety bonded grinding wheels to 2" dia. Any or all Bulletins will be sent on request. Address Onsrud Machine Works, Inc., 3914 Palmer St., Chicago, Ill.

ESCO AND MIJIT STANDARD DRILL JIGS—The 1941 Catalog and Price List of Esco Engineering Corporation carries engineering data and shop information on the single post "B" model, the double post "C" and "D" models and the center line post "E" model. Features include positive locking, interchangeability, low cost design, low first cost and low operating cost. The four models and range of sizes of the Esco Mijit Drill Jigs are similarly treated. A set of Mijit jig drafting templates for saving tool layout time are included in a pocket in the Catalog. For your copy of the 1941 Esco Catalog write Esco Engineering Corporation, 4851 Fourth Ave., Detroit, Michigan.

FOREDOM FLEXIBLE SHAFT TOOLS—Bulletin 20 describes and illustrates the No. 400 Series Tools, an addition to the complete line of Foredom Electric Company's flexible shaft tools. One of the valuable features of these tools is that the flexible shaft and handpiece assembly can be quickly attached to either geared end for low speeds or to motor shaft direct for high speeds. A speed range of from 500 to 1400 RPM is obtainable. Foredom Tools are extensively used in tool and die departments for grinding, polishing, touching up, sharpening and correcting dies, removing high spots and burrs. For your copy of Bulletin 20, write Foredom Electric Co., Dept. 226, 27 Park Place, New York, N. Y.

METAL CUTTING WITH STARRETT "S-M" MOLYBDENUM HACK SAWS—This Starrett booklet outlines the very interesting history of molybdenum and gives the characteristics of the Starrett special alloy high speed steel hack saw blade. Ask your Starrett man for a copy or write the L. S. Starrett Co., Athol, Mass.

LYON HYDRAULIC ELEVATING TABLES—New Bulletin No. 122 shows the line of both Cantilever and Toggle Lever types of Hydraulic Elevating Tables in sizes to handle all types of dies and sheets in the tool room, die shop and press room. The details of construction and operating efficiency are given. For your copy of this Bulletin write Lyon Iron Works, 770 Madison St., Greene, N. Y.

SIMPLEX PRECISION BORING MACHINES—New 12-page Bulletin illustrates the flexibility and the types of precision work accomplished with these machines. Details of design and construction and full specifications are given. The Bulletin is well illustrated. For your copy write Stokerunit Corporation, 4539 W. Mitchell St., Milwaukee, Wis.

DRILL HOLES .002" DIAMETER ECONOMICALLY—Bulletin No. 752 gives details of features in operating, flexibility, economy and long life of Hi-Eff Sensitive Drilling Machines which are made in two series, A and B. Full specifications of five models in each series are given. For your copy of Bulletin 752 write Taylor Mfg. Co., 2328 W. Clybourn St., Milwaukee, Wis.

LOVEJOY MILLING CUTTERS—New Catalog No. 26-T illustrates and gives full specifications on this line of Positively Locked Inserted-Tooth Types of Milling Cutters. Face milling, side milling, staggered tooth grooving mill, deep slotting cutter, plain arbor mills are some of the representative types shown. For your copy of Catalog No. 26-T write Lovejoy Tool Co., Inc., Springfield, Vt.

KOESTLIN "GRINDRITE" DIE GRINDERS—A Catalog distributed by Koestlin Tool and Die Corporation, 3601 Humboldt Ave., Detroit, Mich., describes and illustrates the Grindrite and Grindrite Jr., which, according to the makers, cut tool room and die shop grinding cost 50 per cent. Specifications for both the Grindrite and Grindrite Jr. and a list of users are included. Write for your copy of the "Grindrite" Catalog today.

Knu-Vise Announces "Klampacto", Improved Toggle Action 'C' Clamp

KNU-VISE, Inc., Highland Park, Detroit and Los Angeles, announce the "Klampacto" CEE CLAMP, a greatly improved model of their Toggle Action "C" Clamp which was announced several years ago.

The "Klampacto" is designed for use in the erecting shed, shipyard, roundhouse or work shop. It combines the deep throat of the standard clamp with the tremendous holding pressure of a toggle movement. The lower jaw swings clear of the work when released. Equipped with two handles it is unnecessary to hang onto the clamp and work when fixing it into position since a mere squeeze of the hand applies it with 2000 pounds pressure. The "Klampacto" is furnished with threaded spindle and lock nut, or patented Kam-Lock adjusting rod for use when arc welding to avoid spatter. The "Klampacto" CEE CLAMPS come in three models with a 5-inch, 6-inch and 10-inch jaw, respectively—hardened and tempered with enamel finish and priced from $7 to $10 list, subject to quantity discount.

A specification sheet on the "Klampacto" CEE CLAMP will be sent on request. Address Knu-Vise, Inc., 16841 Hamilton Ave., Highland Park, Mich.; or 7263 Melrose Ave., Los Angeles, Calif.

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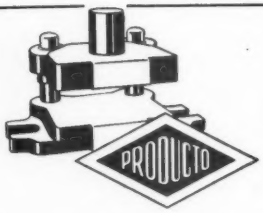

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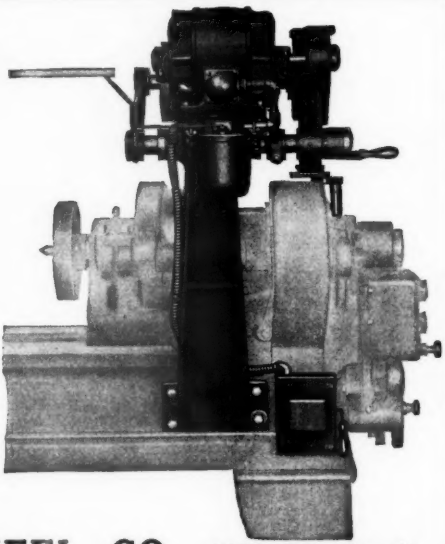

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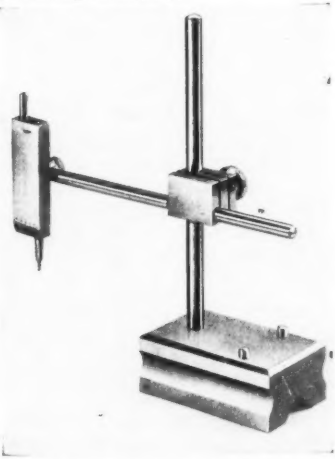
Koch Test Indicator Improved; Attachments Added

THE Koch Test Indicator, the only tool maker's indicator on the market with two working ends, has been improved for better vision and greater accuracy. Each graduation on the scale represents .001" movement of the plunger. The needle plunger now works on the top of the graduations, which are longer and more widely spaced. The Koch is the only low friction indicator with a torsion spring as well as a compression spring, assuring positive and long lasting accuracy.



The Koch Test Indicator is compact, convenient to use and accurate for all tool work. In spite of its sensitivity the Koch is rugged—the case is of cast iron which will not scratch or warp, with the details made of tool steel and the working contacts and bearings hardened to resist wear.

The Koch Test Indicator can now be obtained with a complete set of attachments which adapt it for inspection work on a surface plate, setting up work on milling machines, jig borers and for testing flat surfaces. These attachments fit any surface gage on the market with a $\frac{5}{16}$" binding post.

Bulletin T and prices will be sent promptly. Write The Koch Test Indicator, 28 2nd Ave., Nyack, N. Y.

The Nomenclature List in "Plastics Mold Designing" is the largest ever published.

Haserodt Opens New Shop

RAY HASERODT, who for the past twelve years has been with the Geometric Stamping Company, successively as tool room foreman, superintendent, factory manager and chief engineer, announces that he has left that company

(Continued on next Page)

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(Right) Cross section of new Universal collet chuck showing floating collar that makes locking easy. Available in the 3 larger sizes—Z, ZZ, and YZ.
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Sheffield Corporation Opens New Gage Plant

THE Sheffield Corporation is now in production in their new gage plant at Dayton, Ohio, the first of four gage building facilities directly sponsored by the Government to provide both standard and special gages for Defense work. The plant, representing with its equipment a total outlay of approximately $1,000,000, was opened May 16, one month ahead of schedule. The new building, 80 x 240 feet, has been designed to provide adequate protection in the event of an air raid. The opening of the new building and the operation of its equipment ranks the Sheffield Corporation as the second largest gage making plant in the world.

McKenna Metals Appoints Deakin to Eastern Office

J. ARTHUR DEAKIN has been appointed Eastern District Manager for McKenna Metals Company, Latrobe, Pa., manufacturers of Kennametal steel cutting carbide tools and blanks. He will be in charge of the new Eastern sales office which McKenna Metals Company has just opened at 50 Church St., New York City, and will serve the New England States and northern New Jersey, according to Philip M. McKenna, head of the company.

Mr. Deakin has been engaged continuously in the carbide tool business since its inception in this country in 1928, and for many years previous was active in the machine tool field. He was appointed Eastern representative by McKenna Metals Company when they first introduced Kennametal in 1938.

Haserodt Opens New Shop

(Continued from Page 49)

upon acquiring the assets of the old established Marty Machine Company.

The latter shop has been renovated and a number of larger pieces of equipment have been reconditioned. Mr. Haserodt states that a general tool and die business will be conducted, including the design and building of special machines. The business will be known as Haserodt Machine & Tool, Inc., and is located at 1824 Columbus Road, Cleveland, O.

Use the "Buy with Confidence" Directory Pages 51-56 when you buy.

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Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.
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Forging and Casting Corp., Ferndale (Detroit), Michigan.
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Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
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BUSHINGS—Drill
Universal Engineering Co., Frankenmuth, Mich.
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Starrett Co., L. S. Athol, Mass.
CAMS
Gorton Machine Co., George, 1319 Racine St., Racine, Wisconsin.
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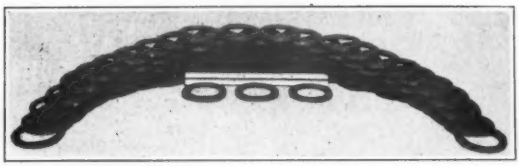

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CUTTERS—Milling
Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
Motor Tool Mfg. Co., 12283 Turner Ave., Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich.
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Producto Machine Co., The, 990 Housatonic Ave., Bridgeport, Conn.
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Jessop Steel Co., 610 Green St., Washington, Pa.
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ELEVATING TABLES—Portable
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, Ohio.

END MILLS
Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
The Tomkins-Johnson Co., 630 North Mechanic St., Jackson, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.

EXTRACTOR—Broken Tap
The Walton Co., 88 Allyn St., Hartford, Conn.

FILES—Band
DoAll Co., Inc., 1203 Thacker St., Des Plaines, Ill.

FILES—RIFFLERS
American Swiss File and Tool Co., Elizabeth, N. J.

FILES—Rotary
American Swiss File and Tool Co., Elizabeth, N. J.
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, Ohio.
Grobet File Co. of America, 8 Park Place, New York City, N. Y.
Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich.

FILES—Swiss Pattern
American Swiss File and Tool Co., Elizabeth, N. J.

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FILING MACHINES—Continuous
Continental Machine Specialties, Inc., 1303 Washington Ave., S., Minneapolis, Minn.
Postel Filing Machine Co., 913 Washington Ave., S., Minneapolis, Minn.

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Marburg Bros., Inc., 88-92 West St., New York, N. Y.

FLAME HARDENING
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.

FORGINGS—General
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

FORGINGS—Water and Oil Hardening, High Speed, Special Alloy, Stainless and S. A. E. Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

FURNACES—Case Hardening
Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Iowa.

FURNACES—High Speed Steel
Johnson Gas Appliance Co, 611 E Avenue, NW, Cedar Rapids, Iowa.

FURNACES—Tempering and Drawing
Despatch Oven Co., 600 S.E. Ninth St., Minneapolis, Minn.
Johnson Gas Appliance Co., 611 E Avenue, NW, Cedar Rapids, Iowa.

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Ford Motor Co., Johansson Division, Dept. H., Dearborn, Mich.
George Scherr Co., 128-B Lafayette St., New York, N. Y.

GAGES—Carbide Tipped
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

GAGES—Center, Depth, Planer, Telescoping, Surface, etc.
The Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.

GAGES—Combination Height and Depth
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

GAGES—Dial
L. S. Starrett Co., Athol, Mass.

GAGES—Precision
Sheffield Gage Corp., 1530 E. Third St., Dayton, O.

GAGES—Spring Stop
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

GRINDERS—Carbide
Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich.

GRINDERS—Cutter
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.
Norton Company, Worcester, Mass.

GRINDERS—Cylindrical
Norton Company, Worcester, Mass.

GRINDERS—Hydraulic Feed
Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.

GRINDERS—Internal
Majestic Tool and Mfg. Co., 2946 Woodbridge St., Detroit, Mich.

GRINDERS—Portable
Dumore Co., Dept. 371-E, Racine, Wis.
McGonegal Mfg. Co., 393 Railroad Ave., E. Rutherford, N. J.

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Boyar-Schultz Corp., 2112 Walnut St., Chicago, Ill.
Koestlin Tool & Die Corp., 3601 Humboldt Ave., Detroit, Mich.

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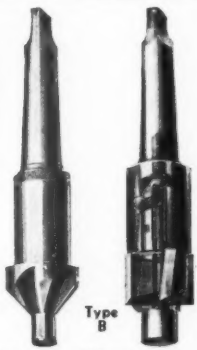

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Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

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Chicago Rawhide Mfg. Co., 1280 Elston Ave., Chicago, Ill.

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Denning Mfg. Co., The, 1775-81 E. 87th St., Cleveland, Ohio.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
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Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, Ohio.

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Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
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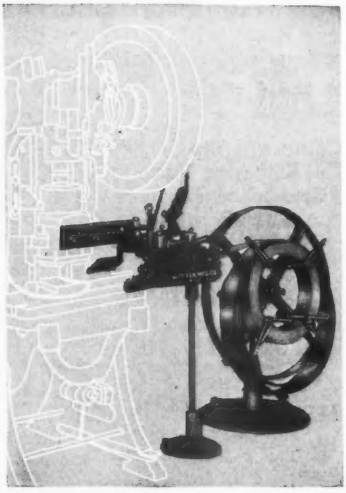

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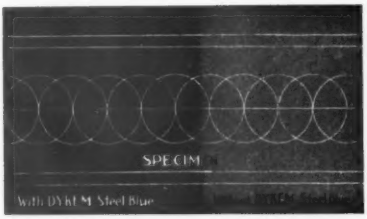

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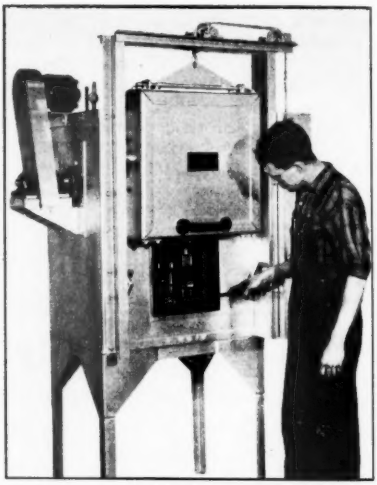

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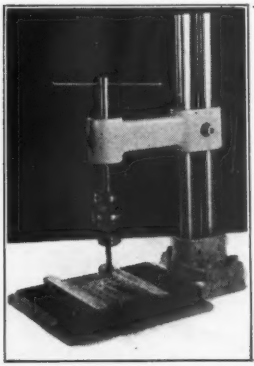
(Continued on Page 66)



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There are ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers.
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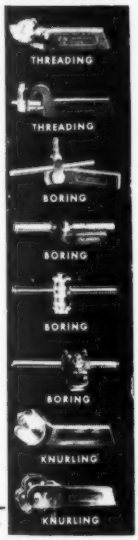

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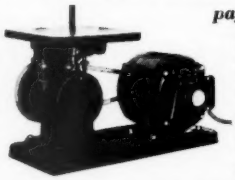

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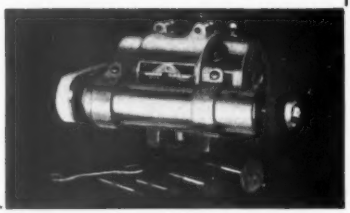

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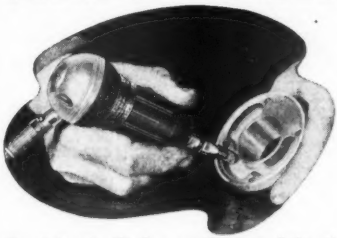

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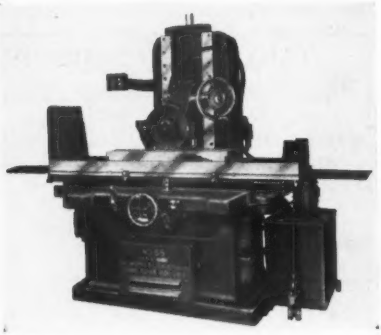

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(Continued from Page 63)

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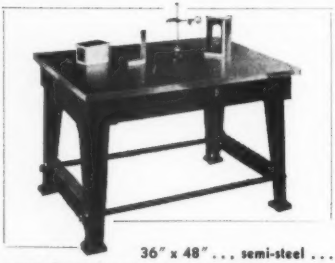

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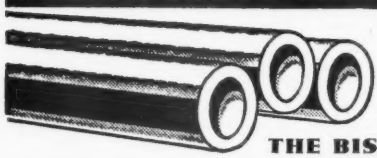

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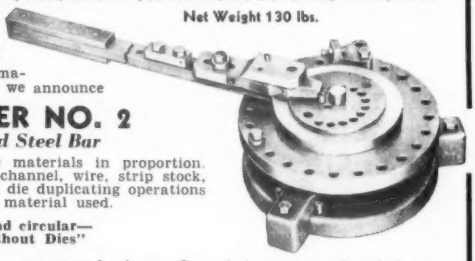

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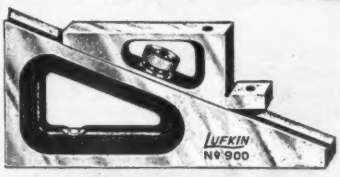

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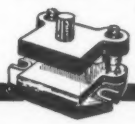

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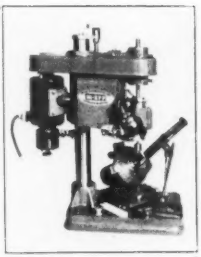

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(Continued from Page 58)

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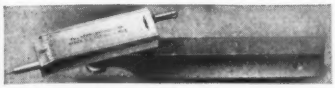

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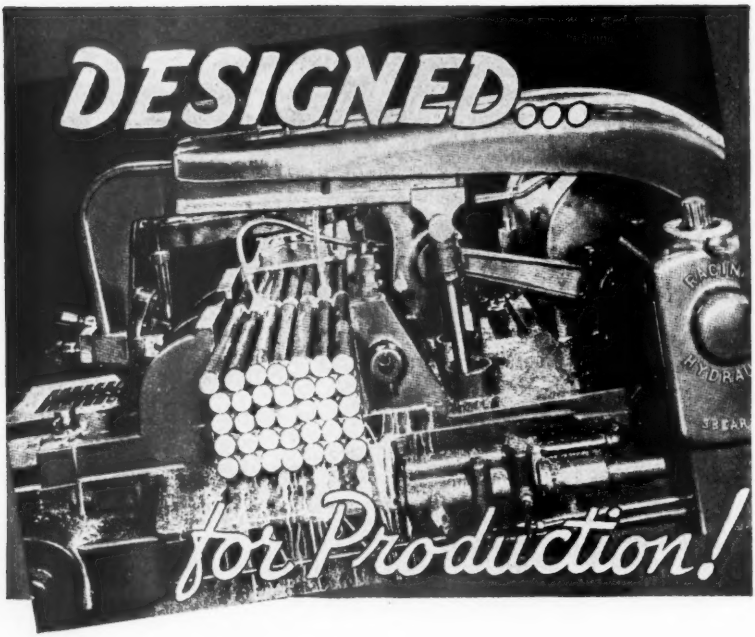

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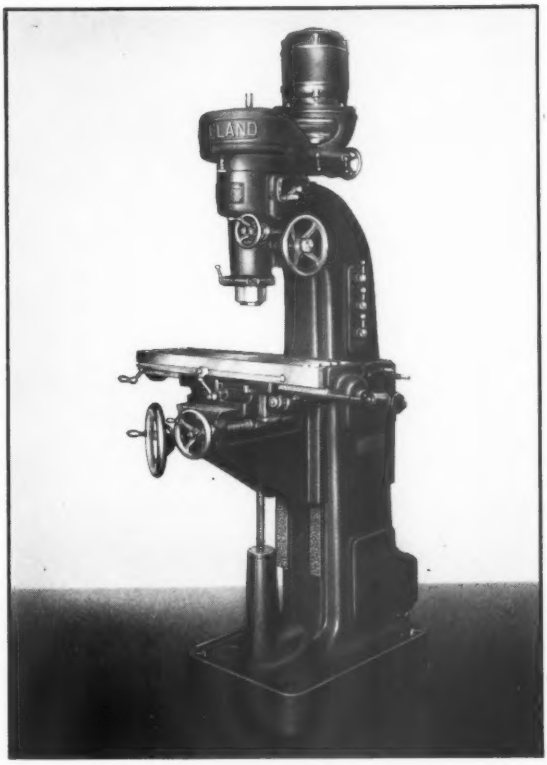

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